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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/676,866
Filing Date: September 29, 2000
Appellant(s): MAURER, RON

Hugh P. Gortler
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on January 25, 2007 appealing from the Office action mailed September 20, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The appellant's statement of the status of claims contained in the brief is substantially correct. Upon review of the appellant's argument's and the applied art the rejection of claims 14, 28, 32, 34, 36 and 45 are withdrawn therefore: claims 5-13, 15, 20-27 and 36 are allowed and claims 3-4, 14, 18, 28-34 and 37-43 are objected as being dependent on rejected base claim but would be allowable if rewritten in independent form including limitations of the base claim and any intervening claims.

(4) Status of Amendments

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Prior Art Relied Upon

U.S 6,031,581 Harrington 2-29-2000.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 16-17 and 29 are rejected under 35 U.S.C. 102 (e) as being anticipated by Harrington (US 6,03,1581).

Regarding claim 1, Harrington discloses reducing chromatic bleeding artifacts in a digital image (Harrington in column 3, lines 35-40 states "When the image such as in FIG. 1 is rendered as a video still image, such as could be converted into a CMY color space for digital printing, the discrepancy in slope between the luminance signal Y and chrominance signal C will create an artifact in the rendered image, wherein the change in chrominance signal will be apparent on either side of the border between the

white area and red area along the line P. Generally, there will result a quantity of "color bleeding" between the two regions, in particular a smudging of some red coloration into the white areas in the image of FIG. 1. and in column 3, lines 55-58, Harrington states "A preferred method of performing this modification of the C [chrominance signal] signals where necessary in the image, using pure mathematical manipulation of the existing signal train, is described". This corresponds to reducing chromatic bleeding artifacts in a digital image) comprising :

reducing chrominance values of at least some pixels in the digital image (Harrington in column 5, lines 5-8, states With reference to the claims hereinbelow, the chrominance revising algorithm given above takes into account what can be called the "edge behavior" of each individual pixel, in column 5, lines 15-20, Harrington states "The revised output value [chrominance revising algorithm] can then be limited by the minimum and maximum values of a neighborhood of the pixel chrominance C_{max} and C_{min}].

c_{max} (i, j)=MAX c(p, q)

c_{min} (i, j)=MIN c(p, q)"

and in column 6, lines 53-56, Harrington states "restricting the revised chrominance value for said pixel to a range between a maximum and minimum chrominance signal of said neighborhood of pixels near pixel and for each pixel in the image, substituting the revised chrominance value for a chrominance signal of said pixel". This restriction of chrominance value of pixel to a range between a maximum and minimum chrominance of neighborhood of pixels near pixel results in the reduction of

chrominance value of pixel above maximum values in range between maximum and minimum corresponds to reducing chrominance values of at least some pixels in the digital image),

the chrominance value of pixel reduced by an amount that scaled according to its chromatic dynamic range (Harrington in column 5, lines 15-20, states "The revised output value [chrominance revising algorithm] can then be limited by the minimum and maximum values of a neighborhood of the pixel chrominance C_{max} and C_{min}" and in column 6, lines 53-56, Harrington states "restricting the revised chrominance value for said pixel to a range between a maximum and minimum chrominance signal of said neighborhood of pixels near pixel and for each pixel in the image, substituting the revised chrominance value for a chrominance signal of said pixel". This restriction of chrominance of neighborhood of pixels near pixel value to a range between a maximum and minimum chrominance results in the reduction of chrominance value of pixel above maximum values in range between maximum and minimum corresponds to the chrominance value of pixel reduced by an amount that scaled [reduced] according to its chromatic dynamic range [range between maximum and minimum chrominance of neighborhood of pixels near pixel]. Furthermore Harrington in column 5, lines 5-50 revises the chrominance values by determining a range of chrominance values C_{MAX} TO C_{MIN}. for a neighborhood of pixels. A final revised chrominance value $C_z(i, j)$ is calculated in column 5, line 25. This final revised chrominance value $C_z(i, j)$ is applied to an error that is distributed to neighboring pixels [column 5, lines 30-45]. The chart in column 5, lines 45-50 is the weighted W(p,q) amount for diffusing the error. The

Examiner notes that the only way weights can be applied to neighboring pixels is by scaling. The weights will scale each pixel by the amount of the weight. Hence, the weight W is generated by determining a range of chrominance values C_{MAX} TO C_{MIN}).

Regarding claim 2, Harrington discloses the chromatic dynamic range for each pixel is a function of minimum and maximum chroma values of a local pixel neighborhood, whereby the chromatic dynamic range is determined on a pixel by pixel basis (Harrington in column 5, lines 5-8, states With reference to the claims hereinbelow, the chrominance revising algorithm given above takes into account what can be called the "edge behavior" of each individual pixel, in column 5, lines 15-20, Harrington states "The revised output value [chrominance revising algorithm] can then be limited by the minimum and maximum values of a neighborhood of the pixel chrominance C_{MAX} and C_{MIN}] and in column 6, lines 53-56, Harrington states "restricting the revised chrominance value for said pixel to a range between a maximum and minimum chrominance signal of said neighborhood of pixels near pixel and for each pixel in the image". In the system of Harrington range between maximum and minimum chrominance signal of said neighborhood of pixels near pixel and for each pixel in the image corresponds to the chromatic dynamic range for each pixel is a function of minimum and maximum chroma values of a local pixel neighborhood, whereby the chromatic dynamic range is determined on a pixel by pixel basis).

Regarding claims 16-17 and 29, the claims are the corresponding apparatus and article of manufacturing claims corresponding to claims 1-2. The discussion are addressed with regard to claims 1-2.

(10) Response to Arguments

The following discussion relates to the rejection of claims 1-2, 16-17 and 29 under 35 U.S.C. 102 (e) as being anticipated by Harrington (US 6,03,1581).

1. Appellant's argument. Harrington does not teach or suggest reducing the chrominance value of pixel by an amount that is scaled according to its chromatic dynamic range.

Examiner's Response. The Examiner respectfully disagree with Appellant's assertion regarding Harrington. Harrington clearly summarizes his invention in lines 4-16 of the Summary Of The Invention, which states:

> For each pixel in the image, an edge activity value is calculated, the edge activity value being related to an amount of change in luminance signals among a neighborhood of pixels near said pixel. For each pixel in the image, a revised chrominance value is calculated, according to a chrominance revising algorithm. The chrominance revising algorithm includes as inputs a chrominance signal for a pixel immediately adjacent said pixel in a vertical direction, a chrominance signal for a pixel immediately adjacent said pixel in a horizontal direction, and the edge activity value for said pixel. For each pixel in the image, the revised chrominance value is substituted for a chrominance signal of said pixel.

In column 5, lines 5-50, Harrington describes in detail how a revised chrominance value is calculated for each pixel.

With reference to the claims hereinbelow, the chrominance revising algorithm given above takes into account what can be called the "edge behavior" of each individual pixel, which is defined here broadly as an amount of change in luminance signals among a neighborhood of pixels near the pixel, and specifically as the luminance change at the pixel, inversely scaled by the overall edge activity of the pixel neighborhood. In the above algorithm, this edge behavior value can be seen as the terms $d_{yx}(i, j)/A(i, j)$ or $d_{yy}(i, j)/A(i, j)$.

The revised output value can then be limited by the minimum and maximum values of a neighborhood of the pixel.

$$c_{max}(i, j)=MAX\ c(p, q) \text{ for } |p-i|<M_2, |q-j|<N_2$$

$$c_{min}(i, j)=MIN\ c(p, q) \text{ for } |p-i|<M_2, |q-j|<N_2$$

Efficient methods to determine the minimum and maximum values for a moving window are well known. The final revised chrominance value is then

$$c_z(i, j)=MAX(c_{min}(i, j), MIN(c_{max}(i, j), c_0(i, j)))$$

The value $c_z(i, j)$ is then output as a substitute chrominance signal for the pixel in the modified image, as shown at block **104**.

The error made by using the c_z output value, shown at block **106**, is

$$E(i, j)=c(i, j)+e(i, j)-c_z(i, j)$$

This error can then be distributed to neighboring pixels

$$e(i+p, j+q)=e(i+p, j+q)+E(i, j)*W(p, q)$$

where W(p, q) is the set of weights for diffusing the error. For example, the Floyd-Steinberg weights can be used, such as in any error-diffusing process, such as shown at block **108**. This chart gives the value of W for the possible values of p and q. W tells how much of the error to give to each neighboring pixel, while, p and q specify the neighbor.

q/p	−1	0	1
0	0	0	7/16
−1	3/16	5/16	1/16

As seen above, Harrington revises the chrominance values by determining a range of chrominance values C_{MAX} TO C_{MIN}. for a neighborhood of pixels. A final revised chrominance value $C_Z(i, j)$ is calculated in column 5, line 25. This final revised chrominance value $C_Z(i, j)$ is applied to an error that is distributed to neighboring pixels (column 5, lines 30-45). The chart in column 5, lines 45-50 is the weighted W(p,q) amount for diffusing the error. The Examiner notes that the only way weights can be

applied to neighboring pixels is by scaling. The weights will scale each pixel by the amount of the weight. Hence, the weight W is generated by determining a range of chrominance values C_{MAX} TO C_{MIN}.

The Examiner notes that claim 1 broadly recites "reducing the chrominance value of pixel by an amount that is scaled according to its chromatic dynamic range". The claim does not go into detail how the chrominance value is scaled or any detail what the chromatic dynamic range corresponds to. The claim could broadly read on a range of "0 or 1" and scaling of "0 or 1", which would result in no amount of scaling.

2. Appellant's argument Harrington method might reduce a chrominance value, and it might reduce it to a local maximum, but it does not reduce it by an amount that is scaled according to its chromatic dynamic range. Harrington's clipping operation only reduces chrominance values that are greater than C_{MAX}, The clipping operation increases chrominance values that are less than C_{MIN}. A chrominance value greater than is set equal to C_{MAX}, and a chrominance value less than C_{MIN} is set equal to C_{MIN}. Thus, Harrington reduces the original chrominance by an amount that is a function of C_{MAX}, which is an upper limit.

Examiner's Response. As discussed in the response of the first argument, in column 5, lines 5-50, Harrington revises the chrominance values by determining a range of chrominance values C_{MAX} TO C_{MIN}. for a neighborhood of pixels. A final revised chrominance value $C_z(i, j)$ is calculated in column 5, line 25. This final revised chrominance value $C_z(i, j)$ is applied to an error that is distributed to neighboring pixels

(col. 5, lines 30-45). The chart in lines 45-50 is the weighted W(p,q) amount for diffusing the error. The Examiner notes that the only way weights can be applied to neighboring pixels is by scaling. The weights will scale each pixel by the amount of the weight. Hence, the weight W is generated by determining a range of chrominance values C_{MAX} TO C_{MIN}. The Examiner notes that claim 1 broadly recites "reducing the chrominance value of pixel by an amount that is scaled according to its chromatic dynamic range". The claim does not go into detail how the chrominance value is scaled or any detail what the chromatic dynamic range corresponds to. The claim could broadly read on a range of "0 or 1" and scaling of "0 or 1", which would result in no amount of scaling.

3. Appellant's argument. Harrington does not reduce the original chrominance by an amount that is function of the dynamic range D where D is the difference between C_{max} and C_{min}.

Examiner's Response. The Examiner would like to point out that claims 1, 16 and 29 do not recite dynamic range D where D is the difference between C_{MAX} and C_{MIN}". Claims 1, 16 and 29 only recite dynamic range. The claim does not go into detail how the chrominance value is scaled or any detail what the chromatic dynamic range corresponds to. As discussed above in column 5, lines 5-50, chromatic dynamic range in Harrington is revised by determining a range of chrominance values C_{MAX} TO C_{MIN}. for a neighborhood of pixels. A final revised chrominance value $C_z(i, j)$ is calculated in column 5, line 25. This final revised chrominance value $C_z(i, j)$ is applied to an error that is distributed to neighboring pixels (col. 5, lines 30-45). The chart in col. 5, lines 45-50,

is the weighted W(p,q) amount for diffusing the error. The Examiner notes that the only way weights can be applied to neighboring pixels is by scaling. The weights will scale each pixel by the amount of the weight. Hence, the weight W is generated by determining a range of chrominance values C_{MAX} TO C_{MIN}. The Examiner notes that claim 1 broadly recites "reducing the chrominance value of pixel by an amount that is scaled according to its chromatic dynamic range". The claim could broadly read on a range of "0 or 1" and scaling of "0 or 1", which would result in no amount of scaling.

4. Appellant's argument. The record provide no other evidence of a suggestion to reduce the chrominance value of a pixel by an amount that is scaled according its chromatic dynamic range.

Examiner's Response . Harrington reference provides evidence in column 5, lines 5-50, chromatic dynamic range in Harrington is revised by determining a range of chrominance values C_{MAX} TO C_{MIN}. for a neighborhood of pixels. A final revised chrominance value $C_z(i, j)$ is calculated in column 5, line 25. This final revised chrominance value $C_z(i, j)$ is applied to an error that is distributed to neighboring pixels (col. 5, lines 30-45). The chart in col. 5, lines 45-50, is the weighted W(p,q) amount for diffusing the error. The Examiner notes that the only way weights can be applied to neighboring pixels is by scaling. The weights will scale each pixel by the amount of the weight. Hence, the weight W is generated by determining a range of chrominance values C_{MAX} TO C_{MIN}. The Examiner notes that claim 1 broadly recites "reducing the chrominance value of pixel by an amount that is scaled according to its chromatic

dynamic range". The claim could broadly read on a range of "0 or 1" and scaling of "0 or 1", which would result in no amount of scaling.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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PRIMARY PATENT EXAMINER

Ishrat Sherali

Dated: June 6, 2007

Conferees:

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